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SOVIET BLOC INTERNATIONAL GEOPHYSICAL YEAR INFORMATION

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PLEASE NOTE

This report presents unevaluated information on Soviet Bloc International Geophysical Year activities selected from foreign-language publications as indicated in parentheses. It is published as an aid to United States Government research.

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I. GENERAL

Soviet Press Coverage of Fifth CSAGI Assembly in Moscow

[The Fifth Assembly of the Special Committee for the Conduct of the IGY (CSAGI) was held in Moscow at Moscow State University imeni M. V. Lomonosov from 30 July to 9 August.

The proceedings of the assembly as reported in the US and Soviet presses are decidedly different in tone.

The US press reported that after the beginning of the assembly, scientists from the US and countries other than the Soviet Union were elated by what appeared to be a loosening in the flow of IGY data from the USSR, in particular from rocket and satellite observations. This feeling prevailed after the presentation of a report by S. N. Vernov and A. Ye. Chudakov of the USSR on cosmic ray investigation by rockets and satellites. This optimism faded as the assembly continued, as manifested by US scientists, who, in closed session with the Soviets, had been rebuffed in their efforts to obtain Soviet commitments on the automatic publication of certain scientific data gathered by rockets and satellites. Agreements on the exchange of data were considered "too general" by Dr Homer G. Newell, Jr., US Naval Research Laboratory.

US scientists, although applauding Soviet hospitality and contributions, voiced their dissatisfaction with Soviet reluctance to exchange data.

The Soviet press coverage presented a different picture, stressing, as usual, the spirit of international cooperation of the IGY and Soviet contributions. The proceedings of the assembly, as reported in the Soviet press, were publicized as follows.]

The purpose of the assembly was to bring together the scientists of the participating countries for the solution of several important problems. The most important of these, perhaps, is concerned with the continuation of the IGY beyond the present 18-month period. The second problem was also connected with the future work of the scientists -- the solution of the many problems remaining before them: the study and generalization of the colossal amount of materials obtained by thousands of scientists.

The Moscow assembly drew about 550 scientists -- more than 300 [the US press gives their number as 220] representing countries other than the USSR. Soviet scientists proposed the use of this meeting for the exchange of some of the scientific results obtained in the course of the

IGY. It was proposed to arrange so-called symposiums in which reports on a number of problems associated in particular with the study of geomagnetism and the ionosphere, on seismology, oceanology, and on rocket and satellite investigations would be made. In addition to this, the Soviet committee organized two open lectures, one on the study of cosmic rays using rockets and artificial earth satellites and the second, on oceanographic investigations by the Soviet expeditionary ship Vityaz.

The assembly formed working groups on meteorology, geomagnetism, aurora and airglow, the ionosphere, solar activity, cosmic rays, longitude and latitude, glaciology, oceanography, rockets and satellites, and seismology. (Pravda, 30 Jul 58; Izvestiya 31 Jul 58)

The highlight of the 31 July session was the reading of a report by S. N. Vernov, corresponding member of the Academy of Sciences USSR, and A. Ye. Chudakov, Soviet scientists, on the results of investigations of cosmic rays with the aid of rockets and artificial earth satellites in the USSR.

The creation of rockets, and, in particular, of artificial earth satellites, opened up wide prospects for the development of many fields of science. Thus, the report notes, it became possible to conduct investigations using measuring instruments placed outside the Earth. This made it possible to study many phenomena, among them, those associated with cosmic rays.

The report gave a detailed history of the problem and showed that the investigation of cosmic rays with the aid of rockets was begun in the Soviet Union in 1947. At first, special instruments (Geiger counters) were used to measure the number of changed particles and to investigate the formation of electrons and photons during the interaction of primary particles in cosmic rays with the atoms of light elements. In 1949, data on the intensity of photons beyond the atmosphere was successfully obtained. An instrument suggested by A. Ye. Chudakov was used for this purpose.

In 1951, ionization caused by cosmic rays was measured up to altitudes of 100 kilometers. For this, an original, highly effective method was proposed and developed.

A series of such investigations was conducted by A. Ye. Chudakov. P. V. Vakulov and V. A. Khvoles participated in the development necessary for this special electronic apparatus and the radio transmission system. The measurement of charged particles was performed by M. I. Fradkin, and that of photons, by V. I. Solov'yev.

Experiments conducted in the study of cosmic rays using rockets, paved the way for new measurements. Some of these have already been realized with Sputnik II and III. The possibilities opened up with their launching make it possible to find a new approach to the solution of important problems. First of all, it is possible to chart the distribution of cosmic rays according to the Earth's globe and thereby to conduct investigations of the Earth's magnetic field.

The long stay of instruments, installed on a satellite, holds out the hope of finding components in the composition of cosmic rays unknown up to the present time. Of particular value for studying the processes taking place in terrestrial space is the search for photons in the composition of cosmic radiation.

The results of measurements of cosmic rays by Sputnik II were presented in the report. The two identical instruments installed in the satellite for this purpose were completely independent of each other. The coincidence of their readings was an indication of the proper functioning of the instruments in flight. The investigations were conducted by S. N. Vernov and A. Ye. Chudakov, together with N. L. Grigorov and Yu.I. Logachev.

The growth of the intensity of cosmic rays with latitude was clearly demonstrated by drawings during the lecture, and the relationship of this intensity to altitude was traced.

An analysis of the obtained data shows that occasionally a considerable increase in cosmic ray intensity was observed. Thus, on 7 November 1957, from 0436 to 0449 Moscow time, at latitudes above 58 degrees, an increase of approximately 50 percent in the intensity of cosmic radiation was simultaneously registered by the two instruments. It is interesting to note that the "flare-up" was not noted by ground stations. It is not rejected that the reason for it is not the increased intensity of primary cosmic rays but an increased density of the flow of relatively low energy electrons.

The possibility of such an explanation, in the opinion of the authors of the report, comes from an analysis of the data obtained by means of Sputnik III. In it was installed a luminescent counter which is highly effective for registering photons.

The growth in the intensity of photons in a determined geographical zone, located at approximately 60 degrees north latitude, was noted for many days. Therefore, the conclusion was drawn in the report concerning the presence of fixed flows of electrons at high latitudes. These electrons, colliding with the body of the satellite, create Roentgen radiation, the photons of which are registered by the luminescence counter.

The changes of cosmic ray intensities observed by satellites differed from variations registered in the same period of time at sea level and in the stratosphere at altitudes of [illegible] kilometers.

According to the report there are apparently two types of variations. Part of them is caused by cosmic rays. Therefore, this part must correspond to the change in the number of primary cosmic rays. The other part is not related to cosmic rays. It is only registered by satellites with the aid of apparatus developed earlier for studying cosmic rays. These variations are caused by radiation which the authors of the report consider it possible to name terrestrial radiation, that is high-energy particles arising near the Earth and moving around our planet.

A. I. Lebedinskiy and S. N. Vernov discussed the possibility of the accumulation of a large number of secondary particles near the Earth. These particles can periodically move from one hemisphere to the other, being, as it were, "locked" in the region of a comparatively weak magnetic field. Each such charged particle can make a large number of oscillations. One of the sources of such particles was indicated by the Soviet scientists as the product of the disintegration of neutrons emitted by the Earth under the action of cosmic rays. The particles of corpuscular flows emitted by the Sun can also be the source of such particles. (Pravda, 1, 8 Aug 58; Izvestiya, 1 Aug 58; Kraznaya Zvezda, 1 Aug 58).

The second of the open lectures, was a report, "Some Problems Connected With the Study of Pacific Ocean Depths." It was presented by L. A. Zenkevich, corresponding member of the Academy of Sciences USSR, and dealt with the work conducted by the Soviet oceanographic ship Vityaz' of the Academy of Sciences USSR.

In the report, for the most part a repetition of materials previously published, the following points were stressed by Zenkovich.

The study of the sea bottom is an extremely promising division of geology. A knowledge of the distribution and thicknesses of bottom depositions in the ocean is very important. Their formation is a grandiose process of the shifting of the solid elements of the Earth's crust totaling about a billion cubic kilometers. (Such a statement can be made on the basis of seismological data.) This is many times more than the mass of all mountain formations and of the total ice cover during the glacial period of our planet.

The necessity of developing highly effective methods for taking soil samples of bottom depositions from various depths was stressed. This can answer the question of changes in the ocean's salinity during the previous geological period.

It is natural, Zenkevich continued, that our attention is attracted to the deep-water depressions. The Vityaz is reported to have discovered 19 such depressions. The deepest of these depressions, mentioned are the Marianna (10,990 meters), the Tonga (10,840 meters), the Kurile-Kamchatka (10,382 meters), the Philippine (10,265 meters), and the Kermadec (10,030 meters).

Of great value in the solution of the problems of marine geology and geophysics is the study of the distribution of deepwater fauna. In particular, valuable material is prescribed for evaluating the age of deep-water depressions.

The problem of the age of the deep waters of the oceans became extremely acute in connection with the proposal of dumping the atomic wastes in the ocean's depths. Investigations along these lines were conducted in the region of the Tonga depression by the Vityaz'.

As a result of a complex study of this problem, Soviet scientists established that the mixing of the waters of deepwater depressions is rather rapid and that the dumping of these radioactive compounds will inevitably cause some of them to be carried into the surface layers of the ocean, entering into the cycle of man's economic activity. Here, they sooner or later will enter plant and animal organisms and fish and mammals.

In concluding, Zenkevich presented interesting data on the distribution of life in the ocean. (Pravda, 2, 3 Aug 58; Izvestiya, 9 Aug 58)

Academician I. I. Sedov discussed a number of important theoretical problems based on observations of Sputnik III and drew certain conclusions. In his report, "Dynamic Effects in the Motion of Artificial Earth Satellites," he said, that the orientation of Sputnik III was determined with the aid of data obtained as a result of processing the readings of special instruments. Preliminary results show that the regime of motion of Sputnik III appeared to be close to that connected with "somersaulting."

Sedov presented figures which attest to the great scientific resources which are at the disposal of Soviet scientists. These concerned the determination of the satellites' orbits. Sixty thousand measurements made during radio observations and 400 measurements made during optical observations were processed for Sputnik I. For Sputnik II, 12,800 measurements during radio observations and 2,000 measurements connected with optical observations were processed. Up to 7 June 1958, for Sputnik III, 52,750 measurements based on radio observations and 1,260 on optical observations were used. All these data were processed on high-speed computers. (Pravda, 6 Aug 58; Izvestiya, 5 Aug 58)

A report on the contributions of Soviet scientists to the IGY program was presented by the Soviet Committee for the Conduct of the IGY.

Eighty-six Soviet scientific institutions are taking part in investigations under the IGY. Their observations are organized according to the 13 divisions of the program. Fixed observations are conducted by 547 stations and observatories In addition to this, there are the antarctic, oceanographic, and other expeditions.

Meteorological observations are conducted by 296 stations and by ships. Valuable results have been obtained by these, in particular, on noctilucent clouds. Observations of the Earth's magnetic field are being carried out by 32 stations. The Zarya, nonmagnetic ship of the Academy of Sciences USSR, in its investigations has established that the actual location of the magnetic equator differs from the location shown on world magnetic maps.

USSR stations engaged in auroral observations total 605. (Pravda, 2 Aug 58)

In the study of the ionosphere and of meteors it is reported that by using different frequencies, radar observations of meteor activity disclosed a fluctuation in the quantity of meteoric matter which falls on the Earth. The distribution of meteor bodies according to their energy characteristics was also explained. In addition to this, new, previously unknown, meteor streams were recorded. The meteor stream observed in Kharkov from 9 to 15 March 1958 merits particular attention.

Observations connected with the Sun Service in the USSR are conducted in 17 observatories. A service on solar radio emission was organized for the first time by 11 stations.

Cosmic ray observations are conducted by 14 stations. Their network was re-equipped with neutron monitors and cubic telescopes.

In another report, Yu. Levin, USSR, presented an analysis of data obtained as a result of visual and radar observations of meteors. It was established that the overwhelming majority of them moved around the Sun in the same direction as does the Earth and overtakes our planet. This information is of value in determining the effect of meteoric matter on space ships. (Izvestiya, 8 Aug 58)

The closing session of the assembly was devoted to the presentation of the reports of the working groups and the final business of the assembly. (Pravda, 10, 12 Aug 58; Izvestiya, 10 Aug 58)

[Comment: No mention is made in the Soviet press of the disappointment expressed by US scientists on the reluctance of the USSR to agree to the free exchange of materials. Nor was there any comment on the absence of scientists from Nationalist China, who reportedly applied for visas and permission to attend the assembly. Nor was there any mention of the protest lodged with CSAGI by members of the Western press against Soviet restrictions on their reports of the conference. This protest was carried by CSAGI to the Academy of Sciences USSR.]

Soviet to Publish Own IGY Materials

The publication of Soviet IGY data in the USSR will be undertaken by the National Committee for the Conduct of the IGY, and will be in the form of a whole series of publications.

A book dealing with that part of the Earth, which is most interesting in a geophysical respect -- Issledovaniye zemnoy Kory v oblasti perekhoda ot Aziatskogo Kontinenta k Tikhomu Okeanu (The Investigation of the Earth's Crust in the Transition Zone From the Asiatic Continent to the Pacific Ocean) has already been prepared and delivered to the publishers.

Prepared for printing are a collection of articles on the preliminary results of scientific investigations with the aid of the first Soviet artificial Earth satellites and rockets. The results of visual observations by the sputniks and the investigation of the propagation of radio waves in the upper atmosphere carried out in the conduct of this unprecedented scientific experiment, and also the results of medical and biological investigations by rockets (among them the vital activity of animals at great altitudes) will be included in this collection.

It is proposed that similar data will be published in the USSR for each of the divisions of the IGY program. (Moscow, Literaturnaya Gazeta, 26 Jun 58)

Descriptive Literature on Major Soviet Astronomical Institutions

In connection with the Tenth International Astronomical Congress which opened in Moscow on 10 August 1958, the Organization Committee of the congress, together with the Publishing House of the Academy of Sciences USSR was to issue at the congress a series of popular brochures on the major astronomical institutions in the Soviet Union. Each of these brochures, listed below, contains historical information, a description of buildings, instruments and the nature of the scientific works of the observatory or institute.

Dadayev, A. N., Glavnaya astronomicheskaya observatoriya v Pulkove (Main Astronomical Observatory in Pulkovo)

Subbotin, M. F., Institut teoreticheskoy astronomii AN SSSR (Institute of Theoretical Astronomy of the Academy of Sciences USSR)

Dobronravin, P. P., Krymskaya astrofizicheskaya observatoriya (Crimean Astrophysical Observatory)

Martynov, D. Ya., Gosudarstvennyy astronomicheskiy institut imeni P. K. Shternberg (State Astronomical Institute imeni P. K. Shternberg)

Kharadze, Ye. K., Abastumanskaya astrofizicheskaya observatoriya (Abastumani Astrophysical Observatory)

Mirzoyan, L. V., Byurakanskaya astrofizicheskaya observatoriya (Byurakan Astrophysical Observatory)

Shcheglov, V. P., Tashkentskaya astronomicheskaya observatoriya (Tashkent Astronomical Observatory)

Shcheglov, V. P. Samarkandskaya astronomicheskaya observatoriya (Samarkand Astronomical Observatory)

Barabashov, N. P., Khar'kovskaya astronomicheskaya observatoriya (Kharkov Astronomical Observatory)

(Nauka i Zhizn', No 6, Jun 58, back cover)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Hungarian Scientist Claims Boron Fuel Used to Place Sputnik III in Orbit

[The following information was contained in a Hungarian source.]

After the orbiting of the third Soviet satellite, keen interest was displayed by the world public regarding future plans of Soviet scientific circles as to the existence of plans to conquer other parts of the universe. In connection with this, Prof Erno Nagy, member of the Committee on Space Navigation of the TTIT (Society for the Propagation of Social and Natural Sciences) stated that the next step will be conquest of the Moon. Soviet scientific circles have completed detailed surveys with regard to the shape of the path to be traveled and to the rate of speed that will be the most suitable at the time the rocket will be fired to reach the Moon. So far, it was found that the most suitable path to be traveled would be the shape of the figure 8 and that the rocket should orbit the Earth in a direction opposite to that which it travels around the Moon. The advantage of it would be that, because the rocket would travel parallel to the direction in which the moon spins, in the course of observations the television transmitter incorporated into the rocket would transmit superior images to the Earth. According to other Soviet plans a Soviet tank laboratory would land on the surface of the Moon to transmit an on-the-spot program to the Earth. The significance of these experiments lies in the fact that in this way it would be possible to determine just what part of the Moon would be suitable as a landing strip for space ships.

Frequently, the question of whether a space station was needed to travel to the Moon is brought up. Professor Nagy stated that with the present rockets taking a trip to the Moon can be assured perfectly well. Space stations will be needed at a later date when the conquest of more remote planets and stellar systems will be projected. For the time being the fuel which has been in use so far fills the bill for the trip to the Moon. It is a mixture of petroleum and liquid oxygen. Sputnik III was propelled by a special fuel called boron, which is a compound consisting of boron and hydrogen. Other compounds are also being made in the Soviet Union through the aid of which the capacity of rockets can be increased by an additional 40-50 percent.

From among the more distant projects the so-called ion rockets which are accelerated by electric particles with positive charges are worth mentioning. Besides traveling within the solar system, ion rockets will be suitable for travels between stellar systems. Even then, however, it will be necessary to use chemical fuels in the first-stage rocket to enable the space ship to leave the atmosphere of the Earth. Soviet scientists are engaged intensively with the construction of rockets with a

nuclear propulsion system. In this case they install an atomic reactor into a furnace which is capable of substantially increasing the temperature of the propellant gas. Solution of the problem of photon rockets may be expected only in the last quarter of the 20th Century. The shell of the Soviet satellite moons was made of a special aluminum alloy. In spots where the satellite moon is expected to become hotter than the rest of the shell, due to the high degree of friction, a special protective coating is added. Part of Sputnik III was coated with magnesium, but silesium and a special coating made of synthetic materials are also suitable for the purpose. Selecting the material from which space ships and rockets are to be manufactured will become a particularly difficult task when the artificial moons that are supposed to return to Earth will be built. These objects will arrive at a high rate of speed in the dense layer of air which surrounds the Earth; therefore, they will heat up very rapidly. According to present concepts titanium and molybdenum will be used to protect the shell of rockets returning to Earth because these elements are capable of withstanding temperatures of 1,500 to 2,000 degrees centigrade. By supplying artificial moons with these protective coatings, they could be made suitable to return to Earth the first experimental animals and maybe man himself from the first trip among the stars. (Hetfoi Hirek, 26 May 58, p 7)

Dobronravov Discusses Significance of Sputnik III in Relation to Space Flights

In an article titled "Scientific Significance of the Third Soviet Earth Satellite," V. V. Dobronravov, of the Chair for Theoretical Mechanics, Moscow Higher Technical School, gives an "original report prepared by the author...on the occasion of his visit to Berlin," containing the following information:

"Of special importance is the installation of the devices for automatic temperature control inside the vehicle, which guarantees a normal operation of many complicated and sensitive instruments. The installation of such an automatic control system for producing certain temperature conditions gives reason to assume that Soviet science and technology are already in a position to design a cockpit for the space flier of future space ships and to guarantee within this cabin an 'artificial climate' and automatic control of this climate during a rather long period of time."

"...It is possible to launch additional satellites of the same type as Sputnik III, but much larger and with even greater launching velocities."

"It is quite possible that the first problem to be solved will be that of producing so-called guided or recoverable satellites. In such a case...the satellite must be 'oriented' in relation to the Earth, i.e.,

its axis must at all times maintain in cosmic space the same position in relation to the Earth. The flight of the satellite on its orbit must be in stages. This satellite must not rotate on its own axis. When it is at point A [apogee] the power can be turned on for a brief period, and the satellite [pointing in toward the Earth] will come closer to the Earth. The propulsion power can also be used as braking power. For example, the engines can be turned on for a certain period of time on a flight path near to the dense layers of the atmosphere, thereby braking the speed of the satellite, which penetrates the dense layers of the atmosphere with correspondingly lower velocities and does not burn up like a meteorite."

In the event that an alternative method [extension of control surfaces on re-entry) is used, "it is necessary that the landing on the Earth be computed in such a way that it will take place not at some point X, but at a previously determined point within the Soviet Union. This problem is, without doubt, very complicated, but, in view of the present state of development of science and technology, automatic control, television engineering, radioelectronics, and instrumentation, it can be solved in stages."

"A vehicle of the Sputnik III type, only somewhat larger, can be converted into a space ship. Inside the vehicle, which is 5-6 meters long and 2.5-3 meters in diameter, space can be provided for one, perhaps even two, [human] fliers, and everything required for a 10-day flight to the Moon and back can be installed. The required velocity of 11 kilometers per second is already a complete reality for Soviet science and technology..."
(Berlin, Die Technik, Vol 13, No 7, Jul 58, pp 473-474)

Evaluation of Effect of Tidal Friction on Lifetime of a Satellite

J. Logie (Journal of the British Interplanetary Society, Vol 13, No 3, 1954, p 170) evaluated the variation of the height of a satellite passing near the Earth by analyzing the ratio of the braking force to the angular velocity of the sputnik. The same problem is attacked by G. A. Leykin, Astronomical Council, Academy of Sciences USSR, in "The Influence of Tidal Friction on the Motion of an Earth Satellite."

Leykin first considers the tidal wave arising under the influence of the satellite, then an evaluation of the value of the moment, and finally the change in the orbit of the satellite under the influence of this moment.

A comparison of the numerical results obtained by Logie with those of Leykin are given. Logie considers a satellite having a mass of 10^{25} grams and an altitude above the surface of the Earth of 483 kilometers and 965 kilometers. Logie arrives at a lifetime of 136 and 337 days, respectively.

Leykin, using the formula

$$t_{Fall} = \frac{2}{L} \left[\left(\frac{Do}{a}\right)^{4.5} - 1\right],$$

(where Do is the initial height of the satellite), which he has derived, arrives at a minimum lifetime of 59 and 136 days for the same conditions. (Astronomicheskiy Zhurnal, Vol 35, No 2, Mar-Apr 58, pp 297-300)

III. UPPER ATMOSPHERE

Nonmolecular Scattering of Light in Upper Atmosphere

An article titled "On the Nonmolecular Scattering of Light in the Upper Layers of the Atmosphere," by V. M. Morozov, Institute of Physics of the Atmosphere. Academy of Sciences USSR, departs from the method of I. A. Khvostikov (Izv. AN SSSR, ser. geofiz. i geograf., Vol 9, No 5/6, 1945, p 425), who introduced into the equation of the searchlight method a term which makes it possible to take into account the effect of the diminution of light in the intermediate levels of the atmosphere. The reason given for this departure is that the conditions under which the simple expression was obtained are not actually maintained in practice. The radiation of the searchlight consists of an intense narrow beam, the beam proper, and a comparatively weak but wide background which, gradually diminishing, extends through an angle of 40 degrees; the sensitivity along the surface of the photocathode (of the photometer used in the measurements) is not constant. The background is computed by the introduction into the equation of the searchlight method an additional term which accounts for the scattering of the light of the background. The expression for the additional term is found by an integration along the sighting line of the photometer within the limits of the background, which accounts for the change of the coefficient of scattering with altitude. The background is assumed to be constant within the limits of the visual angle of the photometer. Additional, experimentally determined functions are introduced to account for the change of sensitivity along the cathode of the photocell.

The background of the beam is determined experimentally by a measurement of the total intensity of the beam proper and of the background, and a separate measurement of the intensity of the background in the vicinity of the beam proper.

The described method of determining the background during a multiple scattering of light affords the possibility of excluding its effect.

It is shown that the scattering function in the lower layers of the atmosphere is considerably different from Rayleigh scattering; it is not known how it changes with altitude. Thus, a practical solution of the equations formulated here is possible only if the boundary conditions are given not at the surface of the Earth, but at a high altitude. By taking measurements with two searchlights and using two equations of the type introduced here, it is possible to determine the optical thickness independent of the form of the indicatrices for the low, most turbid 5-6 kilometer [level]. Above this level the factual indicatrices of scattering also differ from Rayleigh scattering.

The results of a determination, by measurements made in the Moscow region, of light scattering with altitude for an effective wavelength of 0.485 micron are plotted in curves and given in table form. Since the divergences of three curves from the theoretical reference curve for clean air below the 30-km level exceed the admissible measurement error, but are equal to it below the 30-km level, it is concluded that, up to an altitude of 30 kilometers above the surface of the Earth (and, apparently, even up to 40 kilometers), a nonmolecular scattering of light takes place in a searchlight beam. (Moscow, Doklady Akademii Nauk SSSR, Vol 113, No 5, 1957, pp 1039-1042)

Armenian SSR Boasts Largest Soviet Radio Telescope

The 17 August issue of Pravda carries a picture of the largest interference radio telescope in the Soviet Union. The apparatus has a reflecting area of 4,500 square meters. It is located in the Byurakan Astrophysical Observatory of the Academy of Sciences Armenian SSR. The radiation of celestial bodies and of distant star systems are studied with the aid of this radio telescope. (Moscow, Pravda, 17 Aug 58)

IV. SEISMOLOGY

Study of Subterranean Wave Structure

A study of subterranean wave structure entitled "Microstructure and Macrostructure of Elastic Waves in Unidimensional, Continuous, Heterogeneous Media" is presented by B. N. Ivakin in a publication of the Geophysics Institute, Academy of Sciences USSR.

Structure problems are examined for waves which are propagated in continuous, heterogeneous, and generally absorbing media. These studies are limited to segments infinitely small or comparable to the wavelength (microstructure of the wave) and segments larger or considerably larger than the wavelength (macrostructure of the wave). Only one space coordinate is considered.

Solutions to wave problems for absorbing media with one boundary of separation, two boundaries of separation, and periodically recurring layers are obtained in operator form.

A detailed investigation is made of the micro- and macrostructure of the speed of displacement, pressure and intensity of the sinusoidal waves in the above-mentioned cases. The possibilities of solving wave problems in media with evenly changing parameters are also considered. (Trudy Geofizicheskogo Instituta, Akademiya Nauk SSSR, No 39 [166], 1958, 90 pp)

Soviet Seismic Station "Apatity"

A photograph appearing in 17 August issue of Izvestiya bears the following caption:

> "The continental seismic station "Apatity" of the Kola Affiliate of the Academy of Sciences USSR is the northern most station in the European part of the Soviet Union. Here observations specified by the IGY program are conducted, and the seismicity of the Arctic is studied."

The photograph shows G. D. Panasenko, chief of the station, and Yu. G. Blyumberg, attendant on duty, viewing part of the apparatus. (Moscow, Izvestiya, 17 Aug 58)

V. ARCTIC AND ANTARCTIC

Antarctic Symposium in Wellington

The New Zealand National Committee for the IGY held an Antarctic Symposium in Wellington from 18 to 22 February 1958, with the participation of members of all expeditions working directly in Antarctica during 1957-1958.

The symposium discussed the results of research activities in the Antarctic and laid down plans for future work. The Complex Antarctic Expedition of the Academy of Sciences USSR was represented at this symposium by the Marine Expedition, which was joined, after the departure of the Ob' from Mirnyy, by Prof P. A. Shumskiy, chief of the glaciological detachment of the Second Interior Expedition; and V. I. Shlyakhov, senior scientific associate of the aerometeorological detachment of this expedition.

The Ob' arrived in Wellington at 0830 hours on 18 February, after crossing the ocean from the coast of Victoria Land, where the marine expedition had been conducting cartographic and hydrographic work. The symposium began at 1400 hours on the same day. Representatives of Great Britain, Australia, South Africa, Argentina, France, the USSR the US, and New Zealand took part in the work of the symposium. In addition to the official delegation of the Complex Antarctic Expedition of the Academy of Sciences USSR, about 30 scientific associates of various detachments of the Marine Expedition took part. A total of 17 reports were read by Soviet expedition members, including the following: Professors P. A. Shumskiy, V. G. Kort, A. P. Andriyashev, K. A. Brodskiy, K. K. Markov, and V. M. Shapayev; and V. I. Shlyakhov, A. V. Zhivago, F. A. Pasternak, L. V. Klimov, and V. T. Guzeyev, senior scientific associates. The reports of the Soviet delegates, especially in the fields of glaciology, oceanology, and actinometry, aroused great interest and were greatly appreciated by members of the symposium and the New Zealand press.

Interesting reports of foreign scientists were heard at the symposium. The work of American scientists in the study of the ice cover of West Antarctica and the shelf ice of Ross Sea deserves attention.

The personal contacts established among explorers of Antarctica may bring about the most positive results in furthering the development of scientific research work in the Antarctic.

The visit of the Ob' to Wellington, as before in 1956, was a visit of friendship and peace and contributed greatly to a deepening of mutual understanding between the peoples of New Zealand and the USSR. -- Prof V. G. Kort, chief of Marine Antarctic Expedition, Academy of Sciences USSR (Moscow, Priroda, No 7, Jul 58)

Overland Transport in Antarctica

The engineers of the Soviet Antarctic Interior Expedition were faced with the task of preparing their transport equipment for the oversnow traverses into the interior, i.e., the regions of the south geomagnetic pole and the pole of relative inaccessibility, where the stations Vostok and Sovetskaya were to be established.

The technical requirements made of the transport equipment consisted mainly in reducing the weight per unit of area (udel'noye davleniye) of the caterpillar tracks on the ground, to change the design of caterpillar tracks so as to achieve better traction on the snow cover, and to equip the engines with superchargers (nadduv).

The areas of loose, friable snow greatly impeded the movement of sled-tractor trains. The friability of snow is a very negative feature from the transportation standpoint, as it causes the formation of deep ruts behind the truck tractors and sledges, prevents the sliding of metal runners, and thereby creates an additional load for the tractors.

The friable snow also caused a great many difficulties for the pilots of the expedition: the rough surface of the layer of fine, powdered snow did not permit the necessary gliding of the metal plane skis. As the pilots expressed it, the planes stood on the snow, "as on emery paper," not moving from the spot, even with the engines running at full speed. Later on, the engineering service of Polar Aviation found an effective method of overcoming this property of loose snow.

A number of plants undertook the task of producing oversnow vehicles required for the antarctic expedition. The Khar'kov Plant soon produced a truck-tractor specially adapted for long-distance interior expeditions. The new tractor has caterpillar tracks up to 750 millimeters wide, the tracks easily grip the snow surface, the clearance has been increased to a maximum, and the 400-horsepower engine of the tractor has a supercharger which guarantees its operation at all altitudes without reducing power and at the same time maintaining economical fuel consumption. The driver's cab is well heated and the roof is equipped with two hatches.

With the help of these vehicles, the polar expedition members completed the oversnow traverses into the interior to establish the station Vostok in December 1957 and the station Sovetskaya in February 1958.

The Chelyabinsk Tractor Plant produced a shipment of special vehicles for Antarctica. This vehicle, S-100 AB, was built on the basis of the S-80 series-produced tractor. The S-100 AB tractor was supplied with an engine, equipped with a turbocompressor. As a result, the engine has a 90-95 horsepower at an altitude of 3,500-4,000 meters above sea level, when the outside temperature of the air is minus 30 degrees. The track width of the tractor was increased by 400 millimeters, which made it possible to install caterpillar tracks with a width of 1,000 millimeters, equipped with symmetrical shoes. The widening of the tracks reduces the weight per unit of area on the snow.

The vehicles delivered by the Chelyabinsk Plant proved highly satisfactory in the unloading of the Ob' in November 1957.

The Soviet explorers of Antarctica are also using another type of tractor vehicle, i.e., the "Pingvin" oversnow vehicle, produced by the Kirov Plant in Leningrad. An experimental run made by the "Pingvins" in January 1958 from Mirnyy to Pionerskaya and back showed their dependability and other advantages over the former types of caterpillar tractors.

The trailer equipment used by the Soviet expedition consists of special large-capacity sledges of several types. The main type is a steel sledge, about 9 meters long and 3.5 meters wide. The expedition also has lightweight sledges made of duralumin; their runners are covered with plastic (plastikat), enabling easy gliding. A third type of sledge used by the expedition is made of duralumin with runners faced with stainless steel.

Equipped with these different means of transport adapted to antarctic conditions, the Soviet polar explorers are able to undertake any tasks, from the organization of scientific stations in the interior to cross-country transantarctic expeditions. -- Yu. Arshenevskiy, chief engineer of the Main Administration of the Northern Sea Route (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 11 Jun 58)

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